

WHAT IS CLAIMED IS:

1. A cross-incompatible maize plant comprising a TCB trait.
- 5 2. The cross-incompatible plant of claim 1 wherein said plant fails to set seed when
pollinated by plants lacking the TCB trait but sets seed when pollinated by plants carrying the
TCB trait.
- 10 3. The cross-incompatible plant of claims 1 or 2 wherein said plant maintains
functional pollen and sets seed when pollinated by itself or causes other maize plants to set seed
when pollinated by said plant.
- 15 4. The cross-incompatible maize plant of claim 1 wherein said maize plant is an
inbred plant.
- 20 5. The cross-incompatible maize plant of claim 1 wherein said maize plant is a
hybrid plant.
- 25 6. The cross-incompatible maize plant of claim 1 wherein said maize plant is a
haploid plant.
- 30 7. The cross-incompatible maize plant of claim 1 wherein said maize plant is an
apomictic maize plant.
- 35 8. The cross-incompatible maize plant of claims 1, 4, 5, 6 or 7 wherein said plant is
a genetically engineered plant.
- 40 9. The cross-incompatible maize plant of claim 9 further comprising a gene cluster
within its genome wherein said gene cluster is located on the short arm of chromosome 4
between map units 40-85.

10. The cross-incompatible maize plant of claim 9 further comprising a *Tcb* locus within its genome.

11. The cross-incompatible maize plant of claim 10 wherein said *Tcb* locus is located on the short arm of chromosome 4 about 6 map units distal to the *sugary1* gene and about 40 map units from the *Gal* gene.

12. The cross-incompatible maize plant of claim 10 wherein said *Tcb* locus comprises at least one gene which encodes for a silk effect function in said plant.

13. The cross-incompatible maize plant of claims 10 or 12 wherein said *Tcb* locus comprises at least one gene which encodes for a pollen effect function in said plant.

14. The cross-incompatible maize plant of claims 9, 10, 12 or 13 further comprising at least one modifier gene within its genome.

15. A cross-incompatible maize plant comprising a TCB trait and which (1) fails to set seed when pollinated by plants lacking the TCB trait but sets seed when pollinated by plants carrying the TCB trait; and (2) maintains functional pollen and sets seed when pollinated by itself or causes other maize plants to set seed when pollinated by said plant.

16. The cross-incompatible maize plant of claim 15 wherein said maize plant is an inbred plant.

17. The cross-incompatible maize plant of claim 15 wherein said maize plant is a hybrid plant.

18. The cross-incompatible maize plant of claim 15 wherein said maize plant is a haploid plant.

19. The cross-incompatible maize plant of claim 15 wherein said maize plant is an apomictic maize plant.

20. The cross-incompatible maize plant of claims 15, 16, 17, 18 or 19 wherein said plant is a genetically engineered plant.

21. The cross-incompatible maize plant of claim 15 further comprising a gene cluster within its genome wherein said gene cluster is located on the short arm of chromosome 4 between map units 40-85.

22. The cross-incompatible maize plant of claim 21 further comprising a *Tcb* locus within its genome.

23. The cross-incompatible maize plant of claim 22 wherein said *Tcb* locus is located on the short arm of chromosome 4 about 6 map units distal to the *sugary1* gene and about 40 map units from the *Gal* gene.

24. The cross-incompatible maize plant of claim 22 wherein said *Tcb* locus comprises at least one gene which encodes for a silk effect function in said plant.

25. The cross-incompatible maize plant of claims 22 or 24 wherein said *Tcb* locus comprises at least one gene which encodes for a pollen effect function in said plant.

26. The cross-incompatible maize plant of claims 21, 22, 24 or 25 further comprising at least one modifier gene within its genome.

27. A cross-incompatible maize plant comprising a TCB trait and wherein said TCB trait is derived from plant W22-TCB deposited as ATCC No. PTA-1601.

28. The cross-incompatible maize plant of claim 27 further comprising a gene cluster within its genome wherein said gene cluster is located on the short arm of chromosome 4 between map units 40-85.

5 29. The cross-incompatible maize plant of claim 28 further comprising a *Tcb* locus within its genome.

30. The cross-incompatible maize plant of claim 29 wherein said *Tcb* locus is located on the short arm of chromosome 4 about 6 map units distal to the *sugary1* gene and about 40
10 map units from the *Gal* gene.

31. The cross-incompatible maize plant of claim 29 wherein said *Tcb* locus comprises at least one gene which encodes for a silk effect function in said plant.

32. The cross-incompatible maize plant of claims 29 or 31 wherein said *Tcb* locus comprises at least one gene which encodes for a pollen effect function in said plant.

33. The cross-incompatible maize plant of claims 28, 29, 31 or 32 further comprising at least one modifier gene within its genome.

34. The cross-incompatible maize plant of claim 27 wherein said maize plant is an inbred plant.

35. The cross-incompatible maize plant of claim 27 wherein said maize plant is a
25 hybrid plant.

36. The cross-incompatible maize plant of claim 27 wherein said maize plant is a haploid plant.

30 37. The cross-incompatible maize plant of claim 27 wherein said maize plant is an

apomictic maize plant.

38. The cross-incompatible maize plant of claims 34, 35, 36 or 37 wherein said plant is a genetically engineered plant.

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39. A process for obtaining an inbred maize plant, which when crossed with a second inbred maize plant, produces a hybrid maize plant which is cross-incompatible and contains a TCB trait, the process comprising the steps of:

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a) selecting a first donor parental maize plant from a population of maize plants, wherein said first donor parental maize plant is cross-incompatible and contains a TCB trait;

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b) crossing said selected first donor parental maize plant with a second parental maize plant containing genes which encode for desirable traits in hybrid combination;

c) collecting the seed resulting from the cross in step b);

d) planting and growing the seed collected in step c) under plant growth conditions;

e) screening the resulting plant population for the presence of the TCB trait identified in step (a); and

f) selecting plants from said population having the TCB trait for cross-incompatibility for further crossings and screenings until a line is obtained which is homozygous for the TCB trait for cross-incompatibility to provide such a trait in an inbred to be used in hybrid combination.

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40. The process of claim 39 wherein the first donor parental maize plant further comprises a gene cluster within its genome wherein said gene cluster is located on the short arm of chromosome 4 between map units 40-85.

41. The process of claim 40 wherein the first donor parental maize plant further comprises a *Tcb* locus.

42. The process of claim 41 wherein said *Tcb* locus is located on the short arm of chromosome 4 about 6 map units distal to the *sugary1* gene and about 40 map units from the *Gal* gene.

43. The process of claim 41 wherein said *Tcb* locus comprises at least one gene which encodes for a silk effect function in said plant.

44. The process of claims 41 or 43 wherein said *Tcb* locus comprises at least one gene which encodes for a pollen effect function in said plant.

45. The process of claims 40, 41, 43 or 44 wherein the first donor parental maize plant further comprises at least one modifier gene.

46. The process of claim 39 wherein the second parental maize plant is cross-incompatible and comprises a TCB trait.

47. A cross-incompatible inbred maize plant comprising a TCB trait produced by the process of claim 39.

48. A process for producing a cross-incompatible hybrid maize plant exhibiting a TCB trait, the process comprising the steps of:

a) crossing the inbred maize plant of claim 39 with a second maize inbred line comprising genes encoding desirable phenotypic traits to produce a segregating plant population; and

b) collecting the hybrid seed resulting from the cross in step a).

49. The process of claim 48 wherein the second maize inbred line is cross-incompatible and comprises a TCB trait.

50. A cross-incompatible hybrid maize plant comprising a TCB trait produced by the process of claim 48.

51. A process for selecting a first donor parental maize plant suitable for use in producing an inbred maize plant, which inbred maize plant, if crossed with a second inbred maize plant, produces a hybrid maize plant which is cross-incompatible and contains a TCB trait, the process comprising the steps of:

analyzing each plant from a population of maize plants for the presence of a TCB trait.

52. The process of claim 51 further comprising the step of analyzing the DNA of each plant from said population for a gene cluster within its genome wherein said gene cluster is located on the short arm of chromosome 4 between map units 40-85.

53. The process of claim 52 further comprising the step of analyzing the DNA of each plant from said population for a *Tcb* locus.

54. The process of claim 53 wherein said *Tcb* locus is located on the short arm of chromosome 4 about 6 map units distal to the *sugary1* gene and about 40 map units from the gene *Gal* gene.

55. The process of claim 53 further comprising the step of analyzing the DNA of each plant from said population for at least one gene which encodes for a silk effect function in said plant.

56. The process of claims 52, 53 or 55 further comprising the step of analyzing the DNA of each plant from said population for at least one gene which encodes for a pollen effect function in said plant.

5 57. The process of claims 52, 53, 55 or 56 further comprising the step of analyzing the DNA of each plant of said population for at least one modifier gene.

58. A cross-incompatible first donor parental maize plant comprising a TCB trait produced by the process of claim 51.

10 59. A process for selecting a cross-incompatible hybrid maize plant containing a TCB trait, the process comprising the steps of:

analyzing each plant from a population of hybrid maize plants for the a TCB trait.

15 60. The process of claim 59 further comprising the step of analyzing the DNA of each plant from said population for a gene cluster wherein said gene cluster is located on the short arm of chromosome 4 between map units 40-85.

20 61. The process of claim 60 further comprising the step of analyzing the DNA of each plant from said population for a *Tcb* locus.

25 62. The process of claim 61 wherein said *Tcb* locus is located on the short arm of chromosome 4 about 6 map units distal to the *sugary1* gene and about 40 map units from the gene *Gal* gene.

30 63. The process of claim 61 further comprising the step of analyzing the DNA of each plant from said population for at least one gene which encodes for a silk effect function in said plant.

64. The process of claims 61 or 63 further comprising the step of analyzing the DNA of each plant from said population for at least one gene which encodes for a pollen effect function in said plant.

5 65. The process of claims 60, 61, 63 or 64 further comprising the step of analyzing the DNA of each plant of said population for at least one modifier gene.

66. A cross-incompatible hybrid maize plant comprising a TCB trait produced by the process of claim 60.

10 67. A process of controlling hybridization of a maize plant in a field, the process comprising the step of planting in a field a cross-incompatible maize plant of claims 1, 4, 5, 7, 8, 15, 16, 17, 19, 20, 27, 34, 35, 37, 38, 47, 50, 58 or 66.

15 68. A process of controlling hybridization of inbred maize plants in a field being used in hybrid seed production, the process comprising the step of planting in a field being used for hybrid seed production, a cross-incompatible inbred maize plant of claims 4, 8, 16, 20, 34, 38, 47 or 58.